I Background.

a) Book - Vol II (1250 - 1650) — T of C.

b) cosmology

1. Period — father sky - mother earth - personification

Anaxagoras — Sun = stone

Plato — mother receptacle — totally passive

Aristotle — a) father - generates in another
bisl. mother - generates in self.) pg 95 chart

analogy to cosmos.

b) motion → light ↑ sun fire ↑
heavy ↓ earth air earth ↓

1st book

II. New Science

Copernicus.

(1473 - 1543)

1) ~~three~~ axioms in The Commentariolus. — 98 - 99*

~~triple motion of earth~~

a. earth not center of universe
b. Sun is center of universe
c. sun stationary earth in motion

2) 2nd book — On The Revolutions of the Heavenly Spheres

triple motion of earth. 1500 + chart.

a. earth rotates around its own axis
b. earth rotates around the sun
c. earth tips away & towards the sun.

3) displace 2 sets polarity * 102 - 103

Sun more like God

Galileo (1564-1642) — ennobling of motion earth

In Dialogues concerning the two chief world Systems

earth

Salviati (copernican) ⇒ seek to ennoble the earth by new system — 107 *

Galileo in early notebooks discusses the less noble aspects of earth 107 but **

Salviati — earth really awful of magnetic store - 108.

Qu. is magnetic store > fertile organic 108-9 and life

» Collingwood ⇒ earth = inert matter

displacement re. sun

sun

early notebooks

sun = king 110 *

qualify = many suns in universe

+ general sun 111 -

Sagredo in Dialogue - summary of inversion + displacement 111*

Galileo discovery of materiality in sun - 112

Johannes Kepler
(1571-1630)

Three planetary laws 117 - 119
+ reaffirmation of Copernicus.

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1st 1&2 in Astronomia Nova
1/orbit of planet is perfect ellipse. 118

2nd
speed of earth around sun depends on
degree of proximity to orb sun. 118
a) quasi-magnetic force.
b) Rejects Aristotle-heavy view* 119

3rd
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distance from sun. 119

Kepler made much correlation to prove T laws.

b) analogy with mathematics/other
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Sun // father (G-2) Space // Holy Spirit Stars // Son
+ earth (directly plane of sun) → 121, 122
Sun of G-2

then in Epitome Copernicanae
repeated analogy
Sun // G-2 the father
Space // Holy Spirit
Stars // Son
earth.

---

1. Summary chart. 126 - 127

2. Cap. Gal. & Kepler did undermine Aristotle 128*

Possible potential ontological application of discoveries of Copernicus, Galileo, & Kepler to plot + move women

triple motion
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1) spin — self-rotation
2) tilting - self-governance
3) orbiting - public action

1. ellipse - 124 - 5
   / two foci
2. magnetic attraction

---

women religious
units of same
period -
evidence of T

(medieval -
renaissance writers)

---

more advanced
history -
men + women
Copernicus

inner
laws of
attraction
repulsion

—
not Ptolemaic.

(medieval : renaissance
dialogue)

---

limitation = degree of freedom in human beings
not present in astronomical entities
eternal recurrence

CHAPTER 2

MOTHER AND FATHER IN COSMIC GENERATION

The impact of Aristotelian thought on the philosophy of sex identity is perhaps nowhere more apparent than in the struggle during subsequent centuries to understand the role of sexual differentiation in generation. In ancient philosophy generation was considered on two different levels: the macrocosm, or in the universe as a whole and the microcosm, or in the human being. Accordingly, in this chapter we will consider the ways in which Aristotle's theory of cosmic generation was eventually overturned. Then in the following chapter we will discuss the parallel ways in which Aristotle's theory of human generation was overturned. Attention will particularly be given to arguments about the relation of the sun to the concept of man and of the earth to the concept of woman as well as to the connection made between the sun and the earth with the nature of male and female seed.

Specifically, in the present chapter we will trace emerging attempts to challenge Aristotelian theory by different research methods which were evolving in the development of modern science. These include increasing appeal to mathematical calculations to describe the material world, technological advances in the use of lenses in the telescope, and the use of empirical research to text theoretical hypotheses. In the next chapter we will consider the effects of the new study of human anatomy and the technological

advances in the use of lenses in the microscope. The new scientists reached for knowledge in two opposite directions: outwards to the furthest reaches of the universe and inwards to the most intimate interior reaches of the human body. They also often sought to identify parallel patterns of events between the macrocosm and microcosm. In both areas the "obstinacy" of Aristotelian theory will be manifested even in the face of mathematical and empirical evidence to the contrary. This obstinacy confirms the entrenchment of Aristotelian bases for sex polarity that persisted up to the seventeenth century even with the Copernican revolution in cosmology and with the discoveries of the activity of female seed in human generation.

To be more specific, in ancient Aristotelian cosmology, the earth was described as inferior to the sun because it was a cold, heavy static centre of the universe. In addition, the inert cosmic earth was described as "female" in relation to the active cosmic sun as "male."[1] Mother earth was the heavy static centre of the universe which was ruled by active father sun. The Copernican discovery that the sun, rather than the earth, was the static centre of the motion of the earth, did *not* lead immediately to a reevaluation of the inferiority of the symbolic reference to the cosmic female mother earth. Instead, the sun, as static centre, was given a new interpretation of superiority. In this way, the sex polarity which affirmed the superiority of the male concept remained in place with new symbols, so that while "static centre" was derogatory when applied to Mother Earth, it was laudatory when

applied to father sun. This shift can be called an "inversion" and a "displacement" of sex polarity with reference to the concepts of man and woman as cosmic male and female.

In the next chapter we will see a similar displacement occurring in discussions about the relative contributions of males and females to human generation. Within the Aristotelian model, the claim that the female was passive in reproduction was based upon the faulty claim that she either produced no seed or that her seed was infertile. The discovery of the existence of active female seed did not immediately lead to a shift from a derogatory identification of the concept of woman to a laudatory acceptance of her active status. Instead, we find a displaced sex polarity arising at different level. The active role of female seed was described as less valuable than the active role of male seed.

What this inversion and displacement reveals is the intransigence of the devaluation of the female within Aristotelian thought centuries after empirical data was being amassed which called basic Aristotelian premises into question. This rigidity was in part a consequence of the institutionalization of Aristotelianism in Academia as demonstrated in Chapter 1. It is also ironic because although Aristotle himself would likely have accepted the new scientific discoveries and may have even questioned the foundations for sex polarity which they implied because he believed that all knowledge begins with the senses, many of his disciples chose otherwise and held to a rigidly deductive model of philosophy which contradicted new empirical evidence.

Consequently basic Aristotelian metaphysical principles such as the contrariety of opposites (in this case, of male and female), and a sex polarity of privation which always devalued the female in relation to the male, remained firmly in place in academia even when mathematical and empirical data supporting a contrary hypothesis was discovered.

Charles Schmitt, in "Towards a Reassessment of Renaissance Aristotelianism" makes the general observation that "Aristotelianism did not end with Copernicus, nor even with Galileo and Bacon. In fact, it thrived throughout the sixteenth century, as it never had before, and was still in full bloom for most of the seventeenth century."[2] In this chapter we will see a practical example of this general observation in a study of what can be called the "Copernican Revolution" in the concept of woman as it occurred in theories of cosmic generation. Immanuel Kant popularized the expression "Copernican Revolution" for philosophers when in 1781 he analogically applied the discovery that the earth moved around the sun to his epistemological hypothesis that an observer is an active participant in sensation.[3] Kant identified a "change in point of view" in the Copernican system, in which the subject standing on the earth could no longer be thought of as stationary while observing planetary motion, and he saw the obvious parallel to his theory of perception in which the subject was no longer considered a passive observer of external phenomena. Now the human observer standing on the earth was an active participant in

the activity of understanding by bringing categories to bear on the phenomena observed.

In a similar way, an analogy of a "Copernican Revolution" in science can be applied to a "change in point of view" about the concept of woman in western history. This analogy fits the present study very well because of the historical association of the female with the earth and the male with the sun. This association has two original Greek roots, one mythical and the other philosophical. It has also had numerous applications in other fields, notably literature and art. In this chapter Aristotelian and Platonic cosmological theory will be reviewed, and then some new discoveries within the Copernican revolution that brought about a change in point of view will be considered. Finally, some of the philosophical implications of this change for the concept of woman will be suggested.

Philosophizing Mother Earth previous to the thirteenth century

Hesiod, (c.750BC) wrote in the *Theogony* expressing a Greek myth of the origins of the world by using anthropomorphic characteristics of Mother Earth generating the contents of the cosmos through a kind of mortal combat with Father Sky.[4] The image conveyed of Mother Earth was of a cosmic female being full of energy, creativity, anger, and vengeance. In short, she was an active force engaged in antagonistic battle with Father Sky for power over the universe.

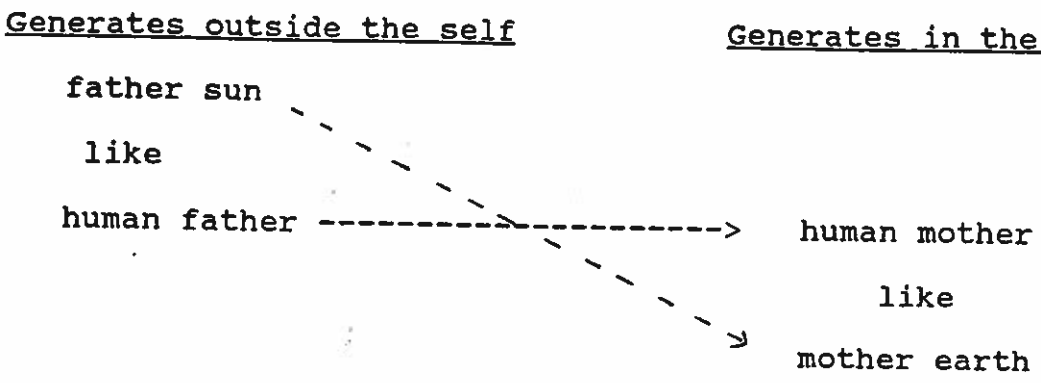
This active aspect of mother earth has been recently elaborated in its association of the female with mother nature by Carolyn Merchant in *The Death of Nature*. She considers the multifaceted ways in which nature has been associated with female behaviour such as nurturing and contrarily, with generating of disorder, and she traces the attempt of men to control this disorder.[5] The claim that the female primarily represents a ferocious overpowering force in her association with mother nature has been argued by Camille Paglia in *Sexual Personae*. In rather striking terms she states: "Microcosm mirrors macrocosm. Free will is stillborn in the red cells of our body, for there is no free will in nature...Tragedy's inhospitality to woman springs from nature's inhospitality to man. The identification of woman with nature was universal in prehistory."[6] Paglia argues that all art and culture is the result of man's attempt to escape from this pervasive destructive force of nature embodied in the female.

The philosopher's understanding of nature differs quite radically from this portrayal. Or perhaps it would be more accurate to say that ancient Greek philosopher's understanding differed. Instead of viewing nature as primarily a category of disorder, they understood it instead as a category of order. While disagreeing about what was the source of, or cause of order, these philosophers none the less searched for the most fundamental principles of nature. For Aristotle, the primary meaning of 'nature' was "the essence of things which have a source of movement in themselves."[7] This view of nature as the essence of an entity that has a

principle of order within itself directs the task of the philosopher to identify the ordering principles that were in each kind of natural species or of individual members of the species.

Aristotle applied this view of nature to a consideration of the relation of male and female to the cosmic entities sun and earth. In *Generation of Animals* Aristotle considered the fact that a male generates "in another" while the female generates "in itself," and he concluded: "That is why in cosmology too they speak of the nature of the earth as something female and call it "mother," while they give to the heaven and sun and anything else of that kind the title of "generator" and "father."[8] While it is clear that Aristotle is not himself directly calling the earth mother and the sun father, he is giving a reason for the joining of these concepts in general cosmology. In itself, it would seem that "to generate in the self" would be just as active a principle as "to generate in another," so with this distinction in and of itself there is no *prima facie* valuation of polarity or the devaluation of the female.

It is worth reflecting on Aristotle's insight into the analogy between mother and earth or father and sun. His view that a fundamental difference between the male and the female is that the former generates in another (or outside of the self) while the latter generates in the self is certainly an accurate description of human reproduction. The analogy can be depicted as follows:



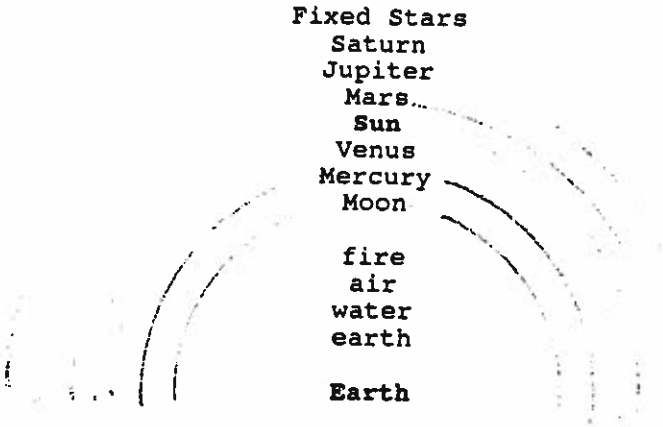
It would seem that the conceptual basis for the analogy of the sun with fatherhood, or the earth with motherhood has some basis in the biological structure of male and female reproductive functions. It is a limited analogy, of course, as the rays of the sun reaching and penetrating the earth are not exactly like male seed reaching and penetrating the female body. However, the basis for the analogy is strong enough to make it not an arbitrary association. For this reason, the concepts of cosmic fathering and cosmic mothering have entered into the heart of discussions about cosmology in general in the last twenty-five centuries. More often than not these concepts also included valuations of the male and the female which reflected theories with a sex polarity foundation.

When Aristotle elaborates more of his philosophy of the nature of the earth and of the sun, the underlying presuppositions of the sex polarity of his cosmology become very evident. In *On the Heavens* Aristotle argued against the Pythagorean view that fire was at the centre of the universe and that the earth, like a star, rotated around this centre. He concluded: "It is clear that the earth does not move and does not lie elsewhere than at the

centre."[9] Aristotle's argument was based on the claim that fire naturally moved upwards, and earth downward, and that fire was "absolutely light" and earth "absolutely heavy." Benedict Ashley, O.P., in *Aristotle's Sluggish Earth: The Problematics of the* <u>*De Caelo*</u> summarizes the philosopher's arguments and then concludes:

> Thus Aristotle was driven to his famous conclusion not by some sort of anthropocentrism which holds that the earth as man's home must be the center of things, but rather by his belief in the eternity of motion. If the motion of the heavens is eternal, they are the most noble physical things. The earth on the other hand remains stationary by reason of its ignobility and inertness. The earth for Aristotle is the dregs of the universe.[10]

A pictorial account of Aristotle's cosmology and theory of the elements can be drawn as follows:



The planet mother earth was the stationary or inert center, from which the elements participated in upward or downward motion, and around which the father sun and the other planets participated in circular motion. At the extremity was a sphere of fixed stars.

The polarity of sun and earth with the former more closely approximating pure form and the latter having the most material is directly followed by a polarity in the relation of the four elements to male and female. For Aristotle, the two higher elements of fire and air are more closely related to the male who is by

nature "hotter" than the female, while the two lower elements of water and earth are more closely associated with the "colder" female. This difference of heat and cold will be seen to play a crucial role in the differentiation of male and female functions in continuity of human generation.

Aristotelian cosmological theory was shored up by mathematical calculations and transmitted by Ptolemy (c.100- C.175). Thomas Kuhn in *The Copernican Revolution: Planetary Astronomy in the Development of Western Thought* argued that Ptolemy was the first philosopher to give a "complete, detailed, and quantitative account of all the celestial motions."[11] The power of Ptolemy's calculations, and the certainty of his mathematically defended theses were so strong that subsequent scientists simply "adjusted" their findings to conform to the Ptolemaic (and Aristotelian) vision rather than question his presuppositions until the combined efforts of Copernicus, Galileo and Kepler finally led the West to a confirmation of the cosmological insight that the earth was in motion.

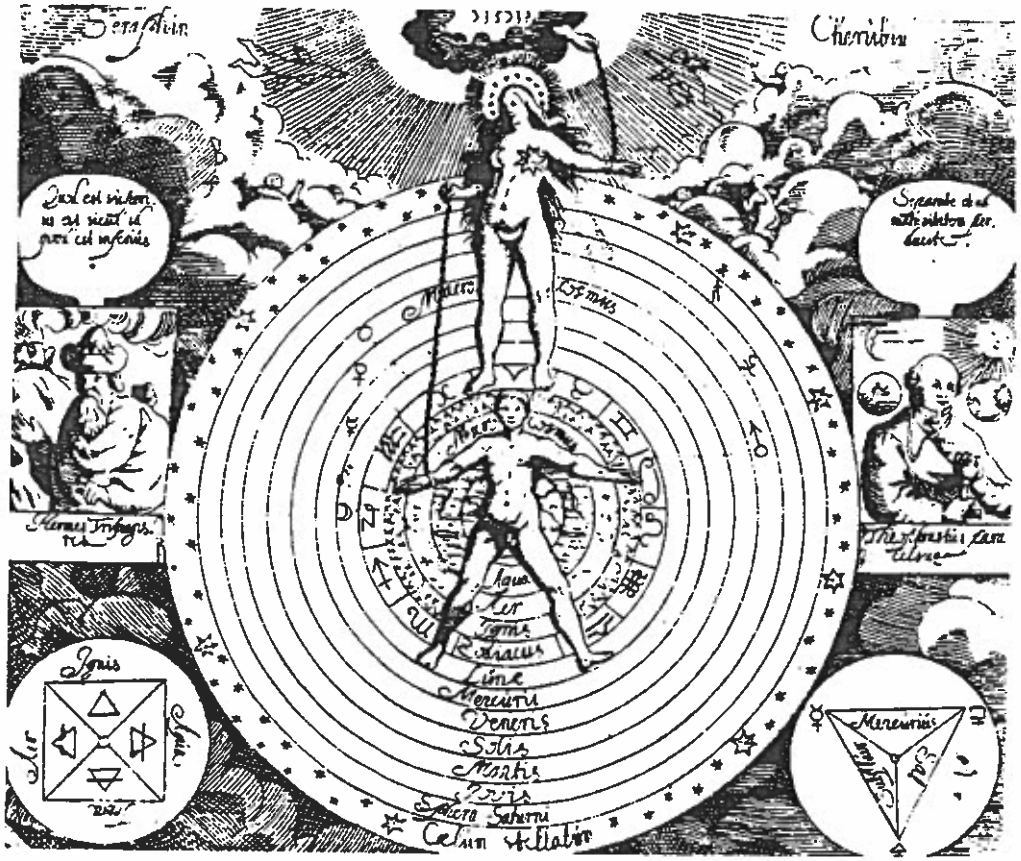
Ptolemy in his introduction to the *Almagest (or Mathematical Syntaxis)* stated that his purpose was "to grasp the relationship of the earth taken as a whole to the heavens taken as a whole." He repeated Aristotle's theory and concluded: "One can show by the same arguments as the preceding that the earth cannot have any motion in the aforementioned directions, or indeed ever move at all from its position at the centre."[12] Ptolemy's acceptance of the Aristotelian cosmology meant that he had to introduce some

artificial adjustments through a notion of epicycles to explain differences in calculations that could not be accounted for by a thesis of an inert earth. The power of this mathematical support for Aristotelian cosmology held firm for many centuries, for Ptolemy's *Almagest* was the standard textbook in mathematical astronomy until well into the seventeenth century. Written first in Greek, translated into Syriac, Arabic and later into Latin, it was printed first in Latin in Venice in 1515 and then as part of the Renaissance revival of ancient languages it was reprinted in Greek in Basel in 1538.

Contrary views did evolve over and against some aspects of Aristotelian cosmology during the Medieval and Renaissance periods. For example, Hildegard of Bingen (1098-1179) identified the highest element fire *and* the lowest element earth with the male, and the two middle elements air and water with the female.[13] Although Hildegard accepted the basic Aristotelian hierarchy of the four elements and the premises of his cosmology, she sought to bring a balance into the sex polarity that his theory had promoted by a more equitable distribution of the elements across the sexes. However, the overwhelming strength of the Aristotelian model supported by Ptolemaic calculations and arguments provided the dominant view of the cosmos during this period in western philosophy.

Platonic and neo-Platonic Theories of Cosmic Generation

Plato's cosmology, as expressed in the *Timaeus*, operated as a shadow, in some ways supporting and in others opposing, Aristotle. In this dialogue the cosmic Father is described as creating a macrocosm with a perfect (i.e., spherical) body of the world which moved in a perfect circular motion, and which was subject to its "ruler and mistress," or world soul. The soul was given a feminine description by Plato, so we find a cosmic hierarchy in the *Timaeus* Father Creator, Female Soul, and Earth as man's abode. In Plato's image the cosmic female force acts as an intermediary between the creator Father and the created men.[14] Plato's creators did not generate something from nothing, but rather put order into preexisting chaos. So the cosmic Father gave the ordering power to the cosmic female soul that in turn ordered the world. This ordering was described as a power of reason, so for Plato the female cosmic principle was immediately associated with this capacity to order through reason. A graphic depiction of this role of the cosmic female was published in the text of the Paracelsian philosopher Robert Fludd (b. 1574). It is included here:



15

This cosmic ordering involved a further factor of sexual differentiation which was invoked to explain how the things in the world themselves were generated. Plato describes a "receptacle, and in a manner the nurse, of all generation," which functions as the "mother and receptacle" and "formless being" which receives the pure Ideas or Forms of all things.[16] Here, the cosmic female receptacle functions on a lower level than the cosmic female soul. It serves as the prime matter which receives the cosmic male forms which are on a higher level as eternal, unchanging realities. Plato

states that "we may liken the receiving principle to a mother, and the source or spring to the father" and he argues that the receiving principle must be perfectly passive in order to receive the forms that enter into and pass out of it. First, the four elements of earth, air, fire, and water, are generated; and then the eternal forms are mixed with matter to generate all other things in the world.

Plato identifies the female cosmic mother at the middle level of world soul as well as at the lowest level of prime receptacle, while Aristotle identifies the female cosmic mother as at the lowest level or the earth and to a lesser degree with the lower elements earth and water. For Aristotle, mother earth was the inert, heavy centre of the universe, which none the less had an organic identity: it "generated in itself." On the other hand, for Plato, the mother receptacle was completely inorganic, and passive as a metaphysical principle of prime matter. Both Plato and Aristotle defended the perfection of circular motion which played a large role in hindering later efforts to identify the planetary motions as elliptical rather than circular. In both theories, however, there was a sex polarity in the hierarchy of male and female cosmic forces in generation within the macrocosm.

In addition, at the end of *Timaeus* Plato suggests that through a series of reincarnations, men "who were cowards or led unrighteous lives may with reason be supposed to have changed into the nature of women in the second generation."[17] This implies that within his cosmology there is also a sex polarity in his theory of

the origin of the lives of individual men and women. While Plato's theories will be considered in much more detail in subsequent chapters of this book, it is worth noting that even though his cosmology suggested a sex polarity, his theories of education and political activity for individual women and men, opened up new avenues of thought about woman's identity. In fact he articulated a sex unity position which was based on a concept of the soul as neither male nor female, and a commitment to the full development of men and women regardless of the bodily identification of sex. However, the *Republic* and *Laws* that contained Plato's defence for sex unity, were not available in translation until well after the thirteenth century in contrast to the *Timaeus* that was well known by this time. Therefore, Plato's cosmology in this latter text provided the context for neo-Platonic theories of cosmic generation.

In 1460, Marsilio Ficino translated the *Corpus Hermeticum* believed to be written by Hermes Trismegistus, a philosopher who was closely linked with Platonic thought. In both the works of Hermes and of Ficino the view that the human being, as a microcosm, reflected exactly the dynamics of the macrocosm was continuously found. This "two world" view was perpetuated through neo-Platonic hermetic writings, and through the works of many of the new alchemists who emerged in the sixteenth and seventeenth centuries.

Carolyn Merchant traces the history of many of the alchemist theorists and gives particular attention to Phillippus Theophrastus Paracelsus (c. 1493-1541) who developed a variation on the

interaction of the cosmic male and female from that found in either Plato or Aristotle. Paracelsus argued that while Heaven acts as a cosmic Father, *each* of the elements (earth, water, air, or fire) is a kind of "mother or matrix" which contains the seeds of generation. [18] In this way he divided the single Mother Receptacle of Plato into four cosmic female principles. At the same time he followed the traditional model of mother earth as being placed in the centre of the cosmos and symbolising fertility and life.[19] Paracelsus took a neo-Platonic interpretation of the Aristotelian elements, and by "spiritualizing" them, he made all of them active.[20] His four elements, frequently called "the four mothers" were not exactly the same as the basic natural elements of the pre-Socratics of which things were composed. Instead, there were the "wombs" from which all natural objects receive their origin and the "seal" of specific forms and functions.[21] So they functioned as four dynamic neo-Platonic matrices or mother receptacles rather than as a single indeterminate Platonic prime Mother receptacle. An intermediary function was provided by salt, mercury, and sulphur.

In a further variation, a later Paracelsian writer, Gerard Dorn (c.1567-c.1610) introduced four astral semina, or four fathers, whose function was to fertilize the four elemental mothers. "The generation of specified objects by eight parents should be distinguished from a primary universal process of generation which has only *one* father and *one* mother, namely sun and moon."[22] For the Paracelsian cosmic generation was not thought of as an analogical but rather a real dynamic activity taking place at

many different levels in the world. It was spiritually based, with a belief in a God who is a duality of male and female, and in a world which equally *is* a duality of male and female.

In *Religion and Neoplatonism in Renaissance Medicine*, Walter Pagel traces the struggle to identify an intermediate body between the eternal forms that were immaterial and unchanging, and things in the world that do change. He mentions that the concept of astral body, or pneuma was one kind of solution. Another intermediary was identified as astral semina which fell from heaven to fertilize the earth. Calling this cosmic intercourse "elemental conjunction," he traces this cosmic generation through writers such as Leo Hebraus, Adam von Godenstein, Guillaume Postel, Johannes Trithemius, Pseudo-Drebbel, Georgius Venetus (Zorzi) and Agrippa von Nettesheim.[23]

The description of cosmic generation as an intercourse of a cosmic male and cosmic female was also found in the Paracelsian writings of Basil Valentine (a probable pseudonym for Johann Thode (f. 1613- 1671). In the following passage, the underlying sex polarity of this view is made evident:

> When Heaven beareth love to the Earth, and the Earth hath love, inclination, and affection for Man, as the great World for the little one, because the little World is taken out of the great, and when the Earth through the desire of an invisible imagination doth attract such Love of the Heavens, then is there a conjunction made of the Superiour with the Inferiour, like unto a husband and his Wife, which are accounted one body: And after such a conjunction the Earth becometh impregnated by such infusion of the superiour Heaven, and beginneth to bear a birth according to the infusion, which birth is ripened, after its conception, by the Elements, and is digested to a perfect maturity.[24]

In all the Paracelsian writings the female places a inferior role in the duality of generation. Therefore, even though the female

cosmic soul, female principle of earth, or "female elements" seem to have an active role to play, they are of a less noble nature than the role of the cosmic male principles.

Before leaving this brief comparison of neo-Platonic and Aristotelian theories of cosmic generation, it is interesting to note that there were several conflicts in academia about these differing views. In 1566 the Faculty of Medicine at the University of Paris, that was Aristotelian in its orientation, condemned certain aspects of Paracelsian theories. In 1624 the Faculty of Arts at the University of Paris (Sorbonne) condemned fourteen alchemical theses. Debus describes a humorous attempt to integrate the various factions in an anonymous play entitled "Le Parnasse asseigé ou la guerre declarée entre les philosophes anciens et modernes." (The seige of [Mount] Parnasse, or the war declared between ancient and modern philosophers). In this play, after the death of Apollo (the God of the Sun), Aristotle is appointed Prince of the Philosophers. Galileo is in charge of the cavalry, with the artillery of the infantry led by Parmenides, Heraclitus, and Democritus. Descartes leads the mounted soldiers, and the alchemical philosophers are in charge of the supplies. Paracelsus joins the defenders at the summit of the mountain.[25] In spite of the desire to give the alchemists and Paracelsus respectability, for the most part the Platonic cosmologists remained outside the mainstream of academic arguments about the nature and identity of the cosmos.

Instead, the main positive influence of Platonic thought on the new science occurred through the renewed interest in mathematics which had been a central part of the Platonic system of epistemology and metaphysics. The Platonic belief that the cosmos itself had a mathematical structure in the most fundamental aspect of its identity had been inherited from Pythagoreanism. While this belief in a true and eternal mathematical structure of the cosmos was tied in Platonic thought to a second claim that the material world was in some sense unreal, in the new science it was for the first time given an application to the concrete world of matter. In the development of physics, mathematics and the material world were joined in a new way. So mathematics was given the real and important position it had within Platonism at the same time as it was seen as a vehicle for understanding the real nature of the material world. We will now turn to the Copernican revolution in cosmology to consider the consequences of the discovery that the earth is in motion for the philosophy of sex identity.

The "triple motion of the earth"

The Polish scientist and philosopher Nicholas Copernicus (1473-1543) was not the first to suggest that the earth was in motion around the sun. Three philosophers in the Pythagorean tradition, Philolaus (c. 6th century BC), Herakleides (c. 4th century BC), and Aristarchus (b. 310BC) described the earth's motion around a central fire, the earth's rotation on its own axis, and the sun as the centre of a heliocentric system.[26] Copernicus

had studied mathematical science at Cracow, astronomy in Bologna, canon law in Bologna and Ferrara, and medicine in Padua before returning to Poland as a cleric and scientist. It is clear that he was familiar with early Greek theories of cosmology for he refers directly to these Pythagorean philosophers in a letter to Pope Paul III: "I therefore set myself the task of reading again the books of all philosophers which were available to me, to search out whether anyone had ever believed that the motions of the spheres of the universe were other than was supposed by those who professed mathematics in the schools."[27]

At the same time Copernicus had realized from scientific calculations that the theory of Ptolemy simply could not account for more recent empirical observations and mathematical calculations. He therefore had to decide whether to accept the conclusions of his studies or to remain within the fixed conclusions of the Ptolemaic (Aristotelian) system. Koestler refers in *The Sleepwalkers* to this dilemma of Copernicus as "Copernicus' fear of the Copernican Revolution," and he argues that the fear was based in pride and the fear of ridicule rather than from any concern for punishment.[28]

In any event, Copernicus bolstered his first exploration of his new theories of cosmology by the above mentioned appeal to Pythagorean theory in his letter to Pope Paul III which was later published as a preface to the text *The Commentariolus* written in 1512.[29] In this text Copernicus mentioned three axioms that are relevant to this study: 1) that the earth is not the centre of the

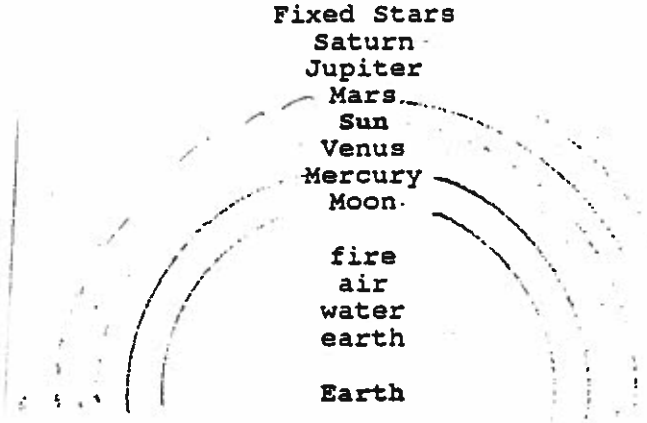
Generates outside the self	Generates in the self
father sun	
like	
human father	human mother
	like
	mother earth

(85-86)

Aristotle's argument was based on the claim that fire naturally moved upwards, and earth downward, and that fire was "absolutely light" and earth "absolutely heavy." Benedict Ashley, O.P., in *Aristotle's Sluggish Earth: The Problematics of the De Caelo* summarizes the philosopher's arguments and then concludes:

> Thus Aristotle was driven to his famous conclusion not by some sort of anthropocentrism which holds that the earth as man's home must be the center of things, but rather by his belief in the eternity of motion. If the motion of the heavens is eternal, they are the most noble physical things. The earth on the other hand remains stationary by reason of its ignobility and inertness. The earth for Aristotle is the dregs of the universe.[10]

A pictorial account of Aristotle's cosmology and theory of the elements can be drawn as follows:



(87)

As can be seen from this chart, in Copernicus' system the positions of the sun and earth with moon were simply interchanged from the ones they held in original Aristotelian system. This constitutes what I call the "Copernican inversion" of earth and sun.[35] Mother earth has shifted from the static bottom to the active middle of the universe, while father sun shifted from active circular motion to a static centre point in the universe.

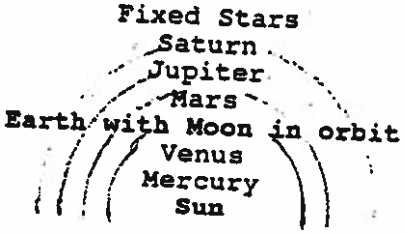


TABLE 5: DISPLACEMENTS IN COSMIC THEORIES OF GENERATION

ARISTOTELIAN MODEL		COPERNICAN MODEL
Position of the Earth		**Position of the Sun**
centre of universe, heaviest, immobile	*Copernicus*	centre of orbit of earth and planets, Lord seated on a royal throne, lantern of the universe
centre, least noble, imperfect	*Galileo*	centre of orbit of earth, King, the "heart" of the planets
centre, naturally heavy	*Kepler*	centre of universe, attracts the earth, dwelling place of God the Father

(126-7)

These shifts or inversions in both macrocosm and microcosm from the Aristotelian theory to the modern theory can be summarized as follows:

		MALE	FEMALE
ANCIENT	COSMIC	like sun	like earth
		hot, in motion around earth	cold, not in motion
	HUMAN	hotter, active seed	colder, no seed or infertile seed
		contributes form only, no matter	contributes matter only, no form
MODERN	COSMIC	like sun	like earth
		stationary centre of the universe	in motion around the sun
		heavenly bodies have matter	in self turning and self tilting motion
	HUMAN	seed contains matter and form	contributes active seed containing form and matter

CHAPTER 2

the sun should be seen as the centre of the rotation of the planet earth:

> Second proof of the same: from the fact that the sun is the king and so to say the heart of all the planets, and for this it is fitting that it be placed in their midst. For the king lives in the center of the kingdom and the heart is in the center of animals, so that they can provide equally therefrom for all the people and for the members.[48]

While the above argument made use of an analogy with the role of king as ruler, most of Galileo's arguments included discussions of the relative positions of the planets from mathematical calculations. Even so, it does indicate a hidden sex polarity in the association of the male king with the value of ruling through being "at the centre." However, it is important to note Galileo thought that the universe as a whole was infinite and that it therefore did not have a true centre. The sun was simply the centre of the rotation of the planets, and not of the universe itself. Even so, the sun ruled the planets including its subordinate mother earth from this position of centre.

In the above analogy the inversion of the role of sun and earth is an example of a displacement of the nobility of the one who is in the middle of the rotation of the planets near the earth. In the Aristotelian model the earth was thought to be in the middle of the rotation of the planets because it was the *least* noble, and the heaviest, while now the sun is thought to be in the middle because it rules and is the *most* noble.

Galileo did not believe that there was only one sun in the universe. Instead he believed that the fixed stars were "many suns" scattered in space. This means that the sun was only a relative

centre in relation to the earth and other planets, and so his inversion of sex polarity in the analogy of the cosmic male with the sun and the cosmic female with the earth is not a complete inversion of the Aristotelian and Ptolemaic model. The latter two philosophers had believed that the earth was an absolute centre of the universe. Copernicus had begun this decentering through his rejection of absolute motion "up and down" in which things tended to fall towards the heavy centre or earth. In the Copernican model, both the sun and the moon were relative centres of gravity, and the centre of the universe was thought to be the centre of the earth's orbit. However, Copernicus believed in a bounded universe in contrast to Galileo whose universe was indefinite in extension. In any event, for both theorists there was an inversion of valuation of the sun and earth, and with the discovery that the earth was in motion around the sun, there was a corresponding displacement of the associated concepts of mother earth and father sun. In all cases the concept of the cosmic male remained in a superior position of valuation, and "scientific" facts were brought forward to explain this view. The cosmic female was similarly devalued.

In *Dialogue concerning the two Chief World Systems* the polarization of the sun and earth was expressed by a third member of the dialogue, a young Sagredo who tended towards accepting the new theory, but was well versed in the old:

> Sagr. Has nature, then, produced all these enormous, perfect, and most noble celestial bodies, invariant, eternal, and divine, for no other purpose than to serve the changeable, transitory, and mortal earth? To serve that which you call the dregs of the universe, the sink of all uncleanness?...Besides, it seems to me that at such times as the celestial bodies are contributing to

> the generations and alterations on the earth, they too must be alterable. Otherwise I do not see how the influence of the moon or sun in causing generations on the earth would differ from placing a marble statue beside a woman and expecting children from such a union.[49]

In this passage, the derogatory view of the earth as the "dregs of the universe" because of its changeable, transitory nature clearly fits the Aristotelian model. And yet he also thought there was a difficulty in suggesting that a cause of change had no change within itself. Galileo came to believe that the heavenly spheres had some materiality because he had observed the three dimensionality of the moon through the use of the telescope by 1610.[50] For Galileo, the Aristotelian polarity between immutable, immaterial heavenly bodies, and mutable material earth had to be rejected because of incontestable empirical and mathematical evidence to the contrary.[51]

By rejecting the Aristotelian theory that the sun was completely immaterial and that the earth was immobile, a wedge was driven between the opposites of immateriality and materiality, hot and cold, active and passive with their corresponding association with the male cosmic father sun and female cosmic mother earth. For Galileo's discovery of materiality in the heavenly spheres and motion in the earth meant that the opposites were becoming more alike one another. Walter Pagel points out that Nicolas of Cusa, whose theory of the infinity of the universe preceded Galileo's, thought that this concept would destroy the polarity of opposites.

> In an infinite universe which is known to us but in an infinitely small proportion, no place remains for gradation, however.

> All objects of our world, though each different from the other, are on an equal footing in dignity. None of them reigns supreme. In other words, there is no room for a world "centre"---the earth as well as the sun being stars like other fixed stars, all of which---including the earth---are in perpetual motion. Nor is the earth inferior to the sun in being "darker" or more perishable. Nor finally is any "sublunary" object less noble than a celestial body. Indeed, each object forms a world of its own. [52]

Galileo, however, did not follow out the implications of the relation of a theory of the infinity of the universe to the interaction of opposites with its specific application to the concept of the cosmic mother earth in relation to the cosmic father sun.

Galileo recognized the power of Aristotelian theory, and he frequently attempted in his dialogue to make a distinction between the philosopher Aristotle himself and Aristotelian disciples who rigidly perpetuated his views. Educated in mathematics at the University of Pisa, Galileo taught at the University of Padua, the centre of Aristotelian studies in Italy.[53] Arguing that Aristotle himself preferred the evidence of "the senses over arguments" he concluded (through the voice of Salviori):

> Therefore it is better Aristotelian philosophy to say, "Heaven is alterable because my senses tell me so," than to say, "Heaven is inalterable because Aristotle was so persuaded by reasoning."...Now we, thanks to the telescope, have brought the heavens thirty or forty times closer to us than they were to Aristotle, so that we can discern many things in them that he could not see.[54]

Galileo pointed out further that the incorruptibility of the heavens had been "proved" by Aristotle through his belief in the eternity and circularity of their motion, but since now the earth itself was discovered to be in an orbital motion, this argument would no longer apply.[55] He concluded that both from the evidence

of the senses, and the incorrectness of the reason, Aristotelian cosmology should be rejected.

Galileo ridiculed the Aristotelians by calling them "inexcusedly simpleminded," "confused," "perplexed," and "concerned only for their own reputations rather than truth."[56] In contrast to this attitude of Aristotelian disciples, he suggested that the Copernican system is "the one Aristotle would have embraced" if he had seen the evidence for its truth.[57] It is important to recognize here that Galileo believed that Aristotle, as an original thinker and scientist in his own right, would have been open to the new discoveries that were being made, and that he would have changed his theoretical framework to accommodate the new truths that were emerging. In a private letter written in 1639 to Fortuno Liceti, professor of Philosophy at the University of Padua, Galileo expressed this appreciation of Aristotle in a striking way:

> ...I am sure that if Aristotle should return to earth he would accept me among his followers on account of my few but conclusive contradictions (of him), much rather than (he would accept) a great many other people too, in order to sustain his every saying as true, go filching from his texts conceptions that never entered his head. And if Aristotle should see the things newly discovered in the sky, though he affirmed it to be unalterable and immutable because no change had been seen there, doubtless he, changing his opinion, would not say the contrary.[58]

A similar argument could be given for the original thinking of the two founders of scholastic thought St. Albert and St. Thomas. They too were original thinkers, and would have followed the dictum that all knowledge begins with the senses. Consequently, they would be willing to rethink any theory, such as that of Copernicus, that contradicted sense experience. Galileo wanted to reject the rigid

views of the peripatetics rather than those of the original theories of Aristotle, St. Albert or St. Thomas.

The events that followed upon Galileo's publication of the *Dialogue* in 1632 are well known. Galileo's ridicule of the traditional theory of the position of the earth in relation to the sun led to an investigation and condemnation by the Holy Office.[59] Galileo "retired" to a villa under house arrest in obedience to a Decree of the Holy Office. These years continued to be productive for his thought and the dissemination of his theories in spite of the so-called retirement.

In 1636 a "Letter to the Grand Duchess Christina" was published in Latin and Italian, twenty one years after it had first been written by Galileo. This letter is significant to our study for two very different reasons. In the first place, it contains Galileo's own thinking about the relationship of the new science both to ancient philosophy as defended by Aristotle and Ptolemy and to faith in the truth of Catholic Scriptures. In the second place, it is an excellent example of a serious intellectual exchange that occurred between a man and a woman about philosophical developments with particular emphasis upon the nature and limits of reason.

The letter had been written originally because of the questions that the Duchess Christina of Lorraine had pressed upon a friend of Galileo's, Benedetto Castelli, a professor of mathematics at the University of Pisa. Castelli told Galileo that rumours of his teachings about the motion of the earth and the stationary position of the sun had reached the court, and that the

Duchess Christina continued to press him for information. He said that "Madame [Christina] began, after some questions about myself, to argue the Holy Scripture against me." He sought to answer her challenges, and claimed that he won over everyone in attendance except apparently the Duchess. However, then he added the observation: "Only Madame Christina remained against me, but from her manner I judged that she did this only to hear my replies."[60] Galileo wrote a letter first to Professor Castelli articulating his own defence in greater detail. This letter was then expanded and sent to the Duchess who had it widely circulated. From this action it can be presumed that she really was in support of the new science, and only used her capacity for argumentation to draw out a more full defence of the new truths that she intuitively found attractive.

The key argument in Galileo's letter was that the new science was compatible with the Bible because "two truths cannot contradict one another."[61] He defended the thesis that God is known first by nature, and through the exercise of the senses, reason, and intellect. In the context of this method of discovery, Galileo referred to the discoveries of Copernicus who "stands always upon...astronomical and geometrical demonstrations, founded primarily upon sense experiences and very exact observations." He concluded that Copernicus knew that "if his doctrine were proved, then it could not contradict the Scriptures when they were rightly understood."[62] For Galileo the discovery of truth was the religious mission of the scientist.

In his letter to the Duchess, Galileo restates his basic premises and the method he used to prove their validity:

> I hold the sun to be situated motionless in the center of the revolution of the celestial orbs while the earth rotates on its axis and revolves around the sun...I support this position not only by refuting the arguments of Ptolemy and Aristotle, but by producing many counter arguments; in particular, some which relate to physical effects whose causes can perhaps be assigned in no other way.[63]

The letter then continues with an analysis of the motivations of the many different men who were attacking Galileo and his arguments. Among them he mentioned particularly the peripatetic philosophers who cling without reason to old views without being open to the radical new discoveries of science.

In spite of his house arrest, in 1638 Galileo published in Leyden a revised version of his dialogue with the new title: *Discourse and Mathematical Demonstration Concerning Two New Sciences Pertaining to Mechanics and Local Motions*.[64] This new version was even more forceful in defending the Copernican theory. Although Galileo's writings gained popularity, Johannes Kepler is credited with having made the Copernican Revolution finally victorious over the cosmology of Aristotle and Ptolemy. It is to his thought that we will now turn.

Reaffirmation of "father sun"

Johannes Kepler (1571-1630) is best known for his discovery of three planetary laws. The first two are defended in *Astronomia Nova* which was first published in 1609. In a letter to Fabricius (whose

work on the dissection of the female body will be studied in the next chapter) Kepler identifies his first law: "I have the answer, my dear Fabricius: the orbit of the planet is a perfect ellipse..., or deviates therefrom by no more than an imperceptible amount."[65] The discovery that the earth travelled in an elliptical orbit around the sun was a blow to the Aristotelian defence of the nobility of circular motion. It also meant that the foci of the ellipse fell neither within the centre of the earth nor the centre of the sun but at a third reference point outside these two centres. So the newly coveted place of "centre" of the planets which father sun had acquired appeared to be just as suddenly lost. However, as will be seen, Kepler found a new way to identify the sun as the centre of the universe.

The second law expressed in the *Astronomia Nova* stated that a planet moved in its orbit at an uneven speed determined in such a way that a line drawn from the planet to the sun always covered an equal area in an equal time along the elliptical orbit. Kepler stated this law as: "If the Earth moves round the Sun, then the law governing its speed, or its slowness, depends on the degree of proximity to, or remoteness from, the Sun."46. Kepler explained the laws governing the interaction of the earth and sun by a theory of "quasi-magnetic force."[66] Anticipating contemporary theories of the force of gravity, the magnetic attraction between sun and earth was used to explain the relationship between the two bodies. Alexandre Koyré summarizes the effect of this discovery of Kepler on the Aristotelian view that the earth was the heavy center of the

universe:

> Expressed more precisely and positively, the Aristotelian doctrine which attributes a natural "heaviness", or "lightness", to bodies, and in consequence a "natural" motion towards a limiting "height", or "depth", (centre of the Universe and the periphery) is totally erroneous and indefensible. Weight, far from being a quality peculiar to "heavy" bodies, or even a tendency to move towards the centre of the Universe, is, on the contrary, a relative property, the result of *attraction*, and this in the most emphatic meaning of the word: not an inherent tendency of things, or the parts of a whole, to reunite (as Copernicus thought) but a real "traction", an action *ab extra*.[67]

So this new law of motion introduced a concept of interactive relationship between father sun and mother earth which was freed of one aspect of the rigid polarity of the Aristotelian system but which moved into another kind of polarity. The attraction between sun and earth was not between a passive heavy organic body and an active spiritual entity which activated the passive entity. Instead in the new system the attraction between sun and earth was related to the mutual dynamism of both material entities, but it was the sun that held the greater force of attraction. Therefore, father sun was centre once again, and the earth remained in orbit at the periphery.

The third law of planetary motion was published in *Harmonices Mundi* (Harmony of the World) in 1619. It is more technical in its expression and is stated as: "The squares of the periods of revolution of any two planets are as the cubes of their mean distances from the sun."[68] This law established the specific correlation between the time frame of a planet's rotation and the distance from the sun. This third law was crucial to Sir Isaac Newton's discovery of the laws of gravity. In fact it was Newton who identified the three above mentioned principles in Kepler as

fundamental laws of nature.

By his mathematical support for these laws that Kepler produced, Aristotelian cosmology was finally overturned. Kepler had been convinced from the start that Copernicus was more accurate than Ptolemy. As early as 1597 Galileo had written to Kepler stating that he had "adopted the teaching of Copernicus many years ago, and his point of view enables me to explain many phenomena of nature which certainly remain inexplicable according to the more current hypotheses." [69] Galileo mentioned further that although he had written arguments in support of Copernicus, that he was afraid to publish them because of the "fate of Copernicus" which at that time was mostly that of ridicule. It was not until 1610 that the work of Copernicus was placed on the Index of Forbidden Books, a list of texts thought to be dangerous for people to read.

While Galileo relied primarily on reasoned arguments to support his claims, Kepler turned to a more empirical basis for his. He discovered that Copernicus' disciple Joachim Rheticus in the *Narratio Prima* had proven by mathematical calculation that his master was more accurate than Ptolemy. However, Kepler made further mathematical calculations over a period of twenty-two years, working first under the supervision of Tycho Brahe between 1597-99. His Copernican calculations of the daily positions of the planets and stars were published in 1627 as the *Tabulae Rudolphinae*. Their accuracy was attested to by the fact that they were used by navigators, astronomers, and calendar makers for more than a century.[70] Through these calculations, and by being able to

describe the laws of nature that they revealed, Johannes Kepler added a further force to the growing rejection of Aristotelian cosmology.

It is interesting to note that this mathematician was trained in the Faculty of Arts and Theology at Tübingen. His background as a theologian and philosopher was revealed by his strong attraction to Platonism and neo-Platonism in several of his works. It is here that we find Kepler adopting a new allegory for the role of the sun as centre of the universe. In the preface to his *Mysterium Cosmographicum* Kepler mentioned a resemblance between the sun, the fixed stars, and intermediate space with the Christian Trinity of Father, Son, and Holy Spirit. In chapter II he drew out this analogy more precisely in stating that "The Sun in the center, which was the image of the Father, the Sphere of the Fixed Stars, or the Mosaic waters, at the circumference, which was the image of the Son, and the heavenly air which fills all parts, or the space and firmament, which was the image of the Spirit." Then Kepler concluded that the stars scattered throughout the heavens "look to us like seed" scattered indiscriminately."[71]

The application of this theology to the theme of cosmic generation is developed in chapter XVI of the same text:

> For it is the Earth to which this third sphere from the Sun is allocated, the Earth by its own impulsion goes around the Sun among the other planets, the Earth on its own and by its own epicycles with no assistance from the Moon for this purpose performs its variations, as Copernicus' theories tell us, but the Moon holds it tiny home round the Earth as if as a favor or on lease, the Moon follows, or rather is dragged, wherever the Earth goes in any of its variations...And certainly the Creator, loving Man, seems finally to have clothed the earth with this lunar sphere, because he wished to allot to it a position similar to the Sun's, so that if it too was the center of a sphere (as the Sun is the center of all things), it

> could be considered as like a Sun; and on that account it was in effect commonly considered the common center of the whole universe.
>
> In general, to indulge in allegory once again, a man is like God in the universe, and Man's dwelling place is the Earth, just as God's, if he has any material dwelling, is certainly the inaccessible light of the Sun. Then as Man to God, so the Earth should have corresponded with the Sun. That is evidenced by the fact that the proportion of the Earth's globe to the sphere of the Moon is almost the same as that of the Sun's globe to the mean distance of Mercury from the Sun.[72]

It might appear that Kepler is ennobling the earth which could have a positive effect on the cosmic concept of woman. However, he is actually developing a *new* analogy in which the earth is given a new dignity *because* it is the centre of the universe *for man*. In his new analogy, the moon is to the earth for man, as the sun is to the planets for God.

At the end of his life, Kepler wrote another text entitled *Epitome Copernicanae* (Copernican Summary) in which he referred again to his theological analogy of the Sun in the centre of the universe as like God, the Father; the fixed stars on the surface as like the Son; and the intervening space between the fixed stars and the Sun as like the Holy Spirit.[73] He described the universe as like an animal with the sun as the organizing power of the soul, the planets as the organs of perception, and the fixed stars as objects of perception. Thus, the Platonic and neo-Platonic traditional description of the world soul as a female cosmic principle was reinterpreted as a male cosmic principle. So once again we find that new developments in thought, which might appear to offer a ground for the revaluation of traditional sex polarity instead lead to a displacing or co-opting of what positive association there had been with an aspect of the concept of the

female by that of the male.

Before considering some contemporary implications of Kepler's cosmology, it is interesting to note that he wrote a story called *The Dream* that is considered as the first historical text in science fiction. While it was composed in 1609, and worked on again between 1620-30, the work was not published until after Kepler's death. In this text he makes multiple uses of the concept of "mothering" in the context of a reflection on the developments of the new science. Identifying as "Mother" the Aristotelian inheritance, and "son" as the new science, he argues that "the old mother" stands for "untutored experience", "ignorance," and clings to an aged life in the universities so tenaciously that she "ought to look upon death as more favorable than life."[74] However, this negative use of the feminine metaphor "Mother" is countered somewhat with Kepler's naming of the main female character in the dialogue "Fiolxhilde." The second part of her name drew upon the German female appellation "hilde" meaning a "female warrior."

Kepler was a strong supporter of his own mother, who had been falsely accused of witchcraft in the town of Weil-der-Stadt in 1615. Kepler officially defended his mother from the charges in court and secured her release after fourteen months in prison, although she died within six months after this traumatic experience.[75] This would suggest, perhaps, that not too much weight should be given to Kepler's derogatory use of the concept "mother" in his story *The Dream*. He merely sought to prove that the new science was given birth by the "aged mother" of Aristotelian

science which had been institutionalized by disciples of Aristotle in academia.

What sort of implications does Kepler's discovery of the three planetary laws have for the concept of woman today? First of all it is crucial to remember that human beings have free will and intellect, and so human actions cannot be simply reduced to planetary motions in spite of frequent suggestions by some astrologists to the contrary. At the same time, there is no doubt that human beings are affected in their materiality by what is often called the biorhythms which occur in relation to planetary motion. The menstrual cycles of women are an obvious correlation of hormonal or chemical changes with planetary motion. There are similar, less obvious cycles in men which follow the daily, monthly, and annual planetary motions.[76] While it would be important to know the way in which one's own materiality and in some cases one's consciousness is affected by planetary motions for the full understanding of one's own sexual identity, this materiality is simply one factor among others in the full self-definition of woman or man as person.

It is also worth considering some possible contemporary analogies which take a rather different approach in relation to Kepler's discoveries. For example, the Aristotelian emphasis upon the perfect circular motion of the heavenly spheres which conceived of motion as having a single focal point was replaced by the notion of an ellipse which must have dual foci centred neither in the sun nor in the earth, but in a third reference point outside of the

other two centres. It is interesting to ask how this shift from circle to ellipse can be applied to the change in consciousness about the intellectual and active relation of women and men in relation to the activity of transforming the public world. In the past, woman was thought of as the inert center of the household around which man "rotated" in his active life in the "civis." Today, however, the external world can serve as a focus outside the self centredness of men and women considered as isolated and alone, and it can depict a cooperative activity of transformation. Thus, Kepler's theory of the ellipse can be seen as analogous to a theory of integral sex complementarity if the traditional association of the sun with the male and the earth with the female is invoked to demonstrate changes in western consciousness.

Similarly, in Kepler's second and third laws, the discovery of the role of gravity in the interaction of sun and earth was expressed. We know today that there are four fundamental forces in the universe (electromagnetism, the strong force, the weak force, and gravity) and that gravity is the weakest of nature's forces. We also know that gravity is orderly, that it shapes the structure of relationship between all the stars and galaxies, and that it plays a role in cosmic expansion.[77] At the same time, we know that attraction and repulsion play an extremely important role in human relations. What might be some analogies between the four forces of nature and human interaction? How is gravity balanced by the other forces to allow the equilibrium and expansion of the universe to occur in an orderly way? How is human freedom able to enter into

situations of attraction and repulsion to make integral choices? All these questions simply begin the process of reflection on the concept of woman in relation to the concept of man by thinking about the emergent qualities found in the levels of integration of sub-atomic particles, atomic particles, chemical, biological, conscious, intelligent, and personal life that an individual woman and an individual man integrate in their respective identities. However, it is important to note that these analogies with Kepler's planetary laws are limited, for his laws relate directly only to the lower levels of integration, while human life goes far beyond them. None the less, there is a relation that is present, and that is what needs to be considered for a contemporary theory of sex identity.

Conclusion: The displacement of sex polarity in cosmic theories of generation

Before ending this chapter we will return to a more immediate reflection on the originally mentioned steps of inversion and displacement of sex identity that occurred in the works of Copernicus, Galileo, and Kepler. We have noted throughout this chapter an inversion that occurred in the discovery that the earth was in motion around the sun and not an inert stable center of the circular motion of the sun. We also considered attempts to "ennoble" the earth that these scientists made in their arguments. The sex polarity of the Aristotelian system, placed a negative valuation on the position of the earth as the centre (inert, dregs, less noble) of the universe was displaced by a discovery that the

sun held a more central position. In the following chart the main lines of argument of these three theories is summarized:

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ARISTOTELIAN MODEL		COPERNICAN MODEL
Position of the Earth		**Position of the Sun**
centre of universe, heaviest, immobile	*Copernicus*	centre of orbit of earth and planets, Lord seated on a royal throne, lantern of the universe
centre, least noble, imperfect	*Galileo*	centre of orbit of earth, King, the "heart" of the planets
centre, naturally heavy	*Kepler*	centre of universe, attracts the earth, dwelling place of God the Father

What this displacement shows is that a sex polarity valuation of the cosmic association of the female with the earth and the male with the sun remained in spite of the inversion of the relative positions of earth and sun. The devaluation of the female in relation to the male held firm, so that the concept of 'centre' was given a *negative* valuation when it was applied to the earth under the Aristotelian sex polarity model, and it was give a *positive* valuation when it was applied to the sun under the Copernican model. Therefore, the new science did nothing immediately to break open the rationale for a sex polarity theory in spite of the potential that its discoveries had for achieving this new orientation.

The most effective consequence of the Copernican Revolution for the philosophy of sex identity was that it began to undermine seriously the rationale that Aristotelian philosophers had used to defend their master's cosmology. Therefore, the new science has an *oblique* rather than direct effect on the philosophy of sex identity. The pattern of this oblique effect can be traced as follows:

1)The new science-->2)undermined Aristotelian cosmology--> 3)undermined Aristotelian theory in general-->4)undermined Aristotelian theory of sex polarity.

A general confidence in Aristotle's theories was shaken by the discoveries of Copernicus, Galileo, and Kepler. A crack in the solid wall of the Aristotelian Revolution began to open; and this crack eventually made possible the rejection of Aristotelian sex polarity.

It is tempting to suggest that this development was the direct result of the tension mentioned in the last chapter between the sex neutrality of Aristotelian logic and the sex polarity of his metaphysics and ethics. For it was demonstrated in chapter 1 that Aristotelian logic provided part of the background of the new science in England, and that when it was combined with mathematics, it provided the theoretical context within which the new science emerged. However, as William R. Shea points out in *Galileo's Intellectual Revolution*, the new astronomers were also affected by a "Platonic conception of scientific procedure [which] implies a predominance of reason over mere experience...and which calls upon

mathematics to interpret nature." With this Platonic approach, for example, Galileo was as content to *think up* experiments as he was to actually perform empirical studies. The criteria for validity was that "they be set up in accordance with the requirements of mathematics."[78] Therefore, it would seem that the new science as practised by the astronomers considered in this chapter was as much influenced by Plato as it was by Aristotelian logic. In both cases the mathematical approach was decidedly rooted in sex neutrality.[79]

Bernard Lonergan in *Insight* decidedly places Aristotelian science together with the science of Copernicus, Galileo, and Kepler (and Newton) in what he calls "classical science," and he contrasts this approach with that found in contemporary science. In particular he identifies classical science as searching for universal and necessary principles, whereas contemporary science searches instead for probable or statistical formulations. Lonergan correctly identifies the similarities in the earlier scientific approach that developed out of the logical and mathematical interpretation of Aristotle's search for a definition that was "always" the case. It ignores, however, Aristotle's biological qualification that he was also considering what was "usually" or "for the most part" the case. It is clear that contemporary probability theories develop this latter side of Aristotle. The reason for Lonergan's simple identification of classical science as aiming towards the necessary, however, was due to the practice of science as conditioned by mathematics. This, as described both in chapter 1 and in this chapter was the consistent model used by the

new scientists. Lonergan views the classical and contemporary scientific approaches as complementary, and he argues that they are both necessary for a correct understanding of the world.[80]

In the next chapter, when we will trace the discoveries of the new science as it moved away from the mathematical investigation of the macrocosm and towards the empirical investigation of the microcosm, it will be seen that the grip of Aristotelian philosophers on Faculties of Medicine was as firm as their hold on the above mentioned Faculty of Arts.

1. The phrase "mother earth" for some authors implied a belief that the earth was a real organic female cosmic entity, while for other authors it was simply thought of as analogous to the human female in some respects. However, even with this difference of denotation of "mother earth," there was an association of the concept of woman with the earth that had significance for the valuation of women. Therefore, in this chapter "mother earth" will be used in the broadest sense to include both kinds of authors. In addition both the use of capitols for Mother Earth and the use of quotation marks for "mother earth" will be dropped for the more simple expression of mother earth unless a specific author being quoted emphasized one or the other expression. The same process will be followed for the use of mother nature.

2. Charles B. Schmitt, "Towards a Reassessment of Renaissance Aristotelianism", *History of Science* II.3.13 (September 1973): 163.

3. Immanuel Kant, *Critique of Pure Reason*, trans. Norman Kemp Smith (London: Macmillan, 1963) 22, 25.

4. Hesiod, *Theogony* (Indianopolis: Bobbs-Merrill, 1953). The notion that the earth and stars were organic entities was common among early Greek thinkers. See, G. E. R. Lloyd, *Polarity and Analogy: Types of Argumentation in Early Greek Philosophy* (Cambridge: University Press,1966) 232-303.

5. Carolyn Merchant, *The Death of Nature: Women, Ecology, and The Scientific Revolution* (San Francisco: Harper and Row, 1980). See also the stream of consciousness meditation on the relation of philosophy, science, and mother earth in Susan Griffin, *Woman and Nature: The Roaring Inside Her* (New York: Harper Colophon Books,

1980). Both authors also reflect on the violent destruction that modern technology has inflicted on a virginal earth.

6. Camille Paglia, *Sexual Personae: Art and Decadence from Nefertiti to Emily Dickinson* (New Haven: Yale University Press, 1990) 7.

7. See R.G. Collingwood, *The Idea of Nature* (Hew York: Oxford University Press, 1960) 80-5, for a discussion of the several different meanings of nature in Aristotle. He also devotes chapters to the pre-Socratics and to Plato.

8. Aristotle, *Generation of Animals* 716a 9-17.

9. Aristotle, *De Caelo* 296b 20-30.

10. Benedict M. Ashley, O.P., *Aristotle's Sluggish Earth: The Problematics of the 'De Caelo'* (River Forest, Illinois: Albertus Magnus Lyceum, 1958) (find page reference). See also, Aristotle, *De Caelo* 311b 15-312a 22.

11. Thomas S. Kuhn, *The Copernican Revolution: Planetary Astronomy in the Development of Western Thought* (New York: Random House, 1959) 72-3.

12. Ptolemy, *Almagest,* trans. and annot. G. J. Toomer (New York: Springer-Verlag, 1984) 37, 43.

13. Hildegard of Bingen, *Heilkunde: das Buch von den Grund und Wesen und der Heilung der Krankheiten (Causae et curae)* Salzburg: O. Muller Verlag, 1972), 97, 103, 124.

14. Plato, *Timaeus* in *The Collected Dialogues of Plato* ed. Edith Hamilton and Huntington Cairns (Princeton: Princeton University Press, 1969) 30a-38b.

15. Allen G. Debus, *The Chemical Philosophy: Paracelsian Science and Medicine in The Sixteenth and Seventeenth Centuries* (New York: Neale Watson Academic Publications, 1977). "The macrocosm and the microcosm, derived from the title page and pages 4-5 of Robert Fludd, *Utriusque cosmi maioris scilcet minoris metaphysica, physica atque technica historia* (Oppenheim: J.T. De Bry, 1617). The portraits of Hermes Trismegistus and Paracelus are based on those on the title page of the earliest editions of Oswald Crollius' *Basilica chymica*. From Tobias Schütze, *Harmonia macrocosmi cum microcosmo* (Frankfurt am Main: Daniel Reicheln, 1654." Plate XXXI, vol. II, 115.

16. Plato, *Timaeus* 50c-51b.

17. Plato, *Timaeus* 89e-91a.

18. Merchant 26-7, 117-121; and Walter Pagel, *Paracelsus: An Introduction to Philosophical Medicine in the Era of the Renaissance* (Basel and New York: S. Karger, 1958) 115.

19. Pagel, *Paracelsus* 238.

20. Allen G. Debus, *Chemistry, Alchemy and the New Philosophy: 1550-1700* (London: Variorum Reprints, 1987) 129.

21. Walter Pagel, *Religion and Neoplatonism in Renaissance Medicine* (London: Variorum Reprints, 1985) 130.

22. Pagel, *Religion*, 131.

23. Pagel, *Religion* IX:94-102.

24. Debus, *The Chemical Philosophy: Paracelsian Science and Medicine in the Sixteenth and Seventeenth Centuries*, 2 vols. (New York: Neale Watson Academic Publications, 1977) 2: 94.

25. Debus, *Chemistry* XII:35-9.

26. Arthur Koestler, *The Sleepwalkers* (New York: Macmillan, 1968) 40-50.

27. Nicholas Copernicus, *On the Revolutions of the Heavenly Spheres*, trans. and ed. A. M. Duncan (New York: Barnes and Noble, 1976) 25-6.

28. Koestler 150-153.

29. Alexandre Koyré, *The Astronomical Revolution: Copernicus-Kepler-Borelli*, trans. Dr. R. E.W. Maddison, F.S.A. (Ithaca: Cornell University Press, 1973) 85, n. 51.

30. Koyré 26-7.

31. Copernicus, I.v, 40.

32. Copernicus I.xi, 51.

33. Copernicus, I.viii, 43.

34. Copernicus, I.viii, 46.

35. See also Henry Guerlac, "Copernicus' and Aristotle's Cosmos," *Journal of the History of Ideas* XXIX.1 (Jan.-Mar.1988): 109-113.

36. Copernicus, I.x, 50.

37. Koestler 197-201.

38. Koestler 211.

39. Francis R. Johnson, *Astronomical Thought in Renaissance England: A Study of the English Scientific Writings from 1500 to 1645* (New York: Octagon Books, 1968) 122, 161-180. See also, Angus Armitage, *The World of Copernicus* (New York: The New American Library, 1963) 122, where he states: "Nowhere was its influence more immediately and remarkably shown than in England."

40. Koestler 191.

41. Johnson 181.

42. Koestler, 563-4 n. 40. (quoted from Luther's *Trischreden,* ed. Walch, p. 226. Try to trace this source)

43. Galileo Galilei, *Dialogue Concerning the Two Chief World Systems--Ptolemaic and Copernican* (Berkeley and Los Angeles: University of California Press, 1962) 37.

44. Galileo Galilei, *Galileo's Early Notebooks: The Physical Questions*, trans. William A. Wallace (Notre Dame: University of Notre Dame Press, 1977) #48, 72.

45. Galileo, *Dialogue* 402-3.

46. Collingwood 102. Stillman Drake, in *Galileo* (New York: Hill and Wang, 1980), argues that Galileo is not as Platonic in his approach to method as Collingwood suggests. Instead, Drake claims that Galileo takes a slightly different approach to mathematics from that of Plato (and Aristotle) who believe that mathematics is concerned with completely abstract truths. Instead, for Galileo mathematics can apply to the concrete material world, and therefore is most useful to physics because it can tell us something about nature. 52.

47. It is precisely this development that Carolyn Merchant traces in *The Death of Nature*, although she does not consider Galileo's role in this process.

48. Galileo, *Early Notebooks* #53, 77.

49. Galileo, *Dialogue* 59-60.

50. Galileo heard about the telescope from the Dutch in 1609 and built his own in 1610. See William R. Shea, *Galileo's Intellectual Revolution* (London: Macmillan, 1972), Kuhn 221-2, and Armitage, 138.

51. For the importance of mathematical calculations to Galileo see, Shea 155.

52. Pagel, *Paracelsus* 280. For further consideration of the philosophy of Nicholas of Cusa who developed this theory of the infinity of the universe a century before Galileo see, *American Catholic Philosophical Quarterly* LVIV.1 (Winter 1990) whose entire volume is devoted to Cusa.

53. See, John Herman Randall, Jr., *The School of Padua and the Emergence of Modern Science* (Padova: Aditrice Antenore, 1961) 26.

54. Galileo, *Dialogue* 55-6.

55. Galileo, *Dialogue* 268.55.

56. Galileo, *Dialogue* 56, 188-9.

57. Galileo, *Dialogue* 321.

58. Stillman Drake, *Galileo at Work: His Scientific Biography* (Chicago and London: The University of Chicago Press, 1978) 409-10.

59. Drake, "The *Dialogue* and The Inquisition" in *Galileo* , 73-93.

60. Stillman Drake, ed and trans. "Letter to the Grand Duchess Christina," in *Discoveries and Opinions of Galileo* (Garden City, New York: Doubleday and Company, 1957) 152.

61. Galileo, "Letter to the Grand Duchess" 186.

62. Galileo, "Letter to the Grand Duchess" 179-80.

63. Galileo, "Letter to the Duchess" 177.

64. Galileo Galilei, *Dialogues Concerning Two New Sciences*, trans. Henry Crew and Alfonso de Salvio (New York: Dover Publications, 1954).

65. Koyré 262. Note that Fabricius rejected his friend's findings: "By your oval or your ellipse, ...you destroy circularity and uniformity of motion, which seems to me quite absurd."

66. Koyré 157.

67. Koyré 193-4.

68. Arthur Koestler, *The Watershed: A Biography of Johannes Kepler* (Garden City, New York: Doubleday and Company, 1960) 221.

69. Koestler, *Watershed* (letter to Kepler August 5, 1597) 173.

70. Koestler, *Watershed* 235-41.

71. Johannes Kepler, *Mysterium Cosmographicum: The Secret of the Universe* (New York: Abaris Books, 1981) 95.

72. Kepler, *Mysterium* 165-7.

73. Koyré 284-5.

74. Johannes Kepler, *Kepler's Somnium: The Dream, or Posthumous Work on Lunar Astronomy*, trans. Edward Rosen (Madison: University of Wisconsin Press, 1967) 36.

75. Koestler, *Watershed* 208, 211-3, 221.

76. See the experiments to this effect on railway drivers in Japan as reported in *Ramparts*. (get reference from file)

77. See Paul Davies, *God and the New Physics* ((New York: Touchstone, 1983) 176-7, and Stephen W. Hawking *A Brief History of Time: From the Big Bang to Black Holes* (Toronto/New York/London:Bantam, 1988) 70.

78. Shea, 155.

79. An interesting side effect of this preference for mathematics was Galileo's reduction of secondary qualities to primary qualities. As will be seen in the chapters on Cartesian rationalism and empiricism, the rejection of primary qualities leads towards a sex unity theory of woman's and man's identity.

80. Bernard Lonergan, S.J., *Insight: A Study of Human Understanding* (New York: Philosophical Library, 1958) "The complementarity of classical and statistical investigations", chapter iv, 103-115.

Extracts from: The Concept of Woman: The Aristotelian Reformation (1250-1650) Vol. II

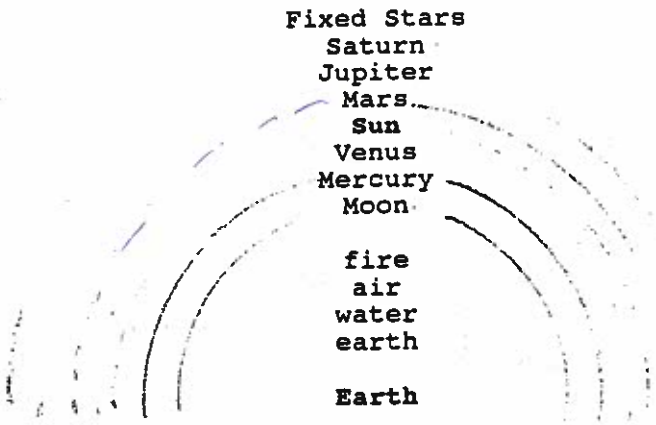
by Sister Prudence Allen, RSM

Generates outside the self	Generates in the self
father sun	
like	
human father ---------->	human mother
	like
	mother earth

Aristotle's argument was based on the claim that fire naturally moved upwards, and earth downward, and that fire was "absolutely light" and earth "absolutely heavy." Benedict Ashley, O.P., in *Aristotle's Sluggish Earth: The Problematics of the De Caelo* summarizes the philosopher's arguments and then concludes:

> Thus Aristotle was driven to his famous conclusion not by some sort of anthropocentrism which holds that the earth as man's home must be the center of things, but rather by his belief in the eternity of motion. If the motion of the heavens is eternal, they are the most noble physical things. The earth on the other hand remains stationary by reason of its ignobility and inertness. The earth for Aristotle is the dregs of the universe.[10]

A pictorial account of Aristotle's cosmology and theory of the elements can be drawn as follows:



universe; 2) that the sun is the centre of the universe; and 3) that the sun is stationary and the earth is in motion.[30]

It was not until his second text, *On the Revolutions of the Heavenly Spheres* that Nicholas Copernicus provided the mathematical calculations which for the first time in over fourteen hundred years could reach the level of "certainty" of Ptolemy's text. However, Copernicus kept this book hidden for thirty years, and tradition holds that he only received the finally published text on his death bed in 1543. In the text, Copernicus sought to prove that his hypothesis that the earth was in motion better explained the data of sense observations than the Ptolemaic hypothesis that had to invoke epicycles and other adjustments in order to "prove" that it was not in motion.

The following passage shows the concern that Copernicus expresses in trying to defend the view that the earth revolves on its own axis to bring about day and night.

> Among the authorities it is generally agreed that the Earth is at rest in the middle of the universe, and they regard it as inconceivable and even ridiculous to hold the opposite opinion. However, if we consider it more closely the question will be seen to be still unsettled, and so decidedly not to be despised. For every apparent change in respect of position is due to motion of the object observed, or of the observer, or indeed to an unequal change of both...Now the Earth is the point from which the rotation of the heavens is observed, and brought into our view. If therefore some motion is imputed to the Earth, but in the opposite direction, as if it were passing by. The first example of this is the diurnal rotation.[31]

The Kantian "change in point of view" is identified here, for the observer looking at the sun is really the one moving, and active instead of the one at rest. Mother earth is no longer seen as static, but in motion.

Copernicus proposes a *hypothesis* that there is not just one but *three* motions of the earth:

> Since therefore so many and substantial pieces of evidence from the wandering stars agree with the mobility of the Earth, we shall now briefly expound the motion itself, insofar as the appearances are explained by it as by a hypothesis; and it must undoubtably be admitted that it is threefold. The first is...the special revolution of night and day, about the axis of the Earth, in the direction from west to east...The second is the annual motion of the centre of the Earth, describing the elliptical circle round the Sun, also from west to east, that is, in consequence, between Venus and Mars, as we have said, along with what rests on it...It follows therefore that there is a third motion, of declination, also in an annual revolution, but westwards, ie, turning in precedence against the motion of the centre.[32]

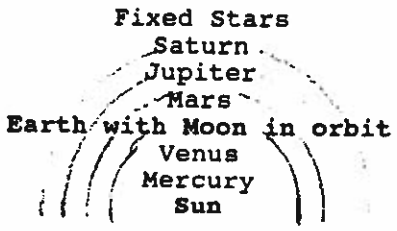
Here we have the basis for Copernicus' "triple revolution" over Aristotelian cosmology: 1) the earth rotates on its own axis, 2) the earth rotates around the sun, and 3) the earth declines or tips away and towards the sun.

Copernicus sought to prove his hypotheses by arguing directly against Aristotle's and Ptolemy's arguments. In Book I, chapter vii, he asked: "Why the ancients thought the Earth was at rest in the middle of the universe as if it was the center;" and in chapter vii he offered: "Refutations of the arguments quoted, and their insufficiency." The Polish scientist began with a description of Aristotle's argument that the reason the Earth was fixed at the center of the universe because earth was the heaviest element. Since things either go up or down, and earth and water, being the heaviest elements go down, and air and fire, as the lightest elements go up, the earth itself had to remain as a stable center for this contrary motion. Next Copernicus described Ptolemy's theory that the earth could not rotate, because it was so heavy

that it would take longer than twenty-four hours to make a complete rotation, and further if it were spinning the things on earth would tend to spin out and away from the earth, instead of falling in towards the earth as appeared to happen when something was dropped. Copernicus concluded: "From these and similar arguments, then, they say that the Earth is at rest in the middle of the universe, and that such is undoubtedly the state of affairs."[33]

Copernicus argued against Ptolemy that the rotating motion of the earth was "natural, not violent." Then employing an analogy with the experience of being on a slow moving ship on a calm day when a passenger would erroneously feel that the ship was standing still while the other things in the environment were moving, Copernicus argued that a better hypothesis would begin with the assumption of the earth's motion. He concluded:" You see then that from all these arguments the mobility of the Earth is more probable than its immobility, especially in the daily revolution, as that is particularly fitting for the Earth."[34]

Not only did Copernicus argue that the earth was not the stable centre of the universe, but he also suggested as a hypothesis that the sun was the centre instead. In Book I, chapter x, "The order of the heavenly spheres," the relation between the planets and the sun can be depicted as follows:



As can be seen from this chart, in Copernicus' system the positions of the sun and earth with moon were simply interchanged from the ones they held in original Aristotelian system. This constitutes what I call the "Copernican inversion" of earth and sun.[35] Mother earth has shifted from the static bottom to the active middle of the universe, while father sun shifted from active circular motion to a static centre point in the universe.

One of the intriguing aspects of this inversion is the effort made by Copernicus to displace by a new form of sex polarity the sex polarity devaluation of mother earth that was present in the Aristotelian model. Instead of arguing that mother earth was superior to father sun because it was active and not static, Copernicus emphasized that the sun which is now recognized to be in the centre of the universe, was now more like God:

> In the middle of all is the seat of the Sun. For who in this most beautiful of temples would put this lamp in any other or better place than the one from which it can illuminate everything at the same time? Aptly indeed is he named by some the lantern of the universe, by others the mind, by others the ruler. Trismegistus called him the visible God, Sophocles' Electra, the watcher over all things. Thus indeed the Sun as if seated on a royal throne governs his household of Stars as they circle round him. Earth also is by no means cheated of the Moon's attendance, but as Aristotle says in his book <u>On Animals</u> the Moon has the closest affinity with the Earth. Meanwhile the Earth conceives from the Sun, and is made pregnant with annual offspring. We find, then, in this arrangement the marvellous symmetry of the universe, and a sure linking together in harmony of the

> motion and size of the spheres, such as could be perceived in no other way.[36]

There are many aspects of the above passage that bear consideration. First of all, Copernicus' appeals to the Platonic and neo-Platonic tradition to support his interpretation of the value of the sun in his cosmology. In this tradition, the sun was analogous to the Good, which in the Christian tradition then became embodied in God. Secondly. Copernicus appeals to Aristotle to defend his theory of the relation of the moon and earth. Thirdly, he reintroduces "macrocosmic" intercourse of a male Sun and female Earth to explain the annual cycles of nature. In any event, the appeal to the heat and light of the sun are what binds the association of the sun with God so that the concept of "being in the centre" simply attaches itself to this strong set of positive characteristics. The concept of passivity in relation to motion is transformed into activity in relation to "lighting up," so all of the negative associations of passive centre of universe that had previously been associated with mother earth no longer apply to father sun.

While there are some critics who prefer to emphasize the ways in which Copernicus broke away from Aristotelian thinking, and embraced neo-Platonism, or even more radically began a new science, Arthur Koestler suggests that Copernicus is actually better thought of as "the last of the Aristotelians."[37] He argues that Copernicus actually *interprets* Aristotle and Ptolemy by using the data of other researchers rather than examine nature directly himself, and

so Koestler concludes that Copernicus therefore is not a good example of an empirical scientist. He argues further that the hypothesis of the motion of the earth is "an incidental matter in the system of Copernicus."[38] Koestler's main criticism is that Copernicus did not adequately separate himself from the Aristotelian and Ptolemaic system to really cause a revolution in thinking in cosmology.

While this observation may be relevant for the broader consideration of the impact of Copernicus on the development of modern science, it would appear that Copernicus' specific hypotheses about the triple motion of the earth did cause some excitement among western academics rather soon. For example in 1576, Thomas Digges published a text entitled *A Perfect Description of the Celestial Orbes according to the most ancient doctrine of the Pythagoreans, lately reviewed by Copernicus and by Geometrical Demonstrations approved*.[39] At the time of this publication Digges was a widely respected astronomer and mathematician in England; his text was republished in six new editions by 1605. Koestler calls Copernicus' original text "The book that nobody read" and the "All time worst seller" because its technical style made it inaccessible to most readers, and the original printing did not even sell out.[40] However, Digges wrote his text in a way that was aimed towards the general reader, so for the first time Copernicus' ideas were exposed to a much wider public.

Some universities were captivated by the new ideas of Copernicus. In 1576 one of the questions debated at Oxford was

"Whether the earth is at rest in the middle of the world?" In 1581 "Whether there is matter in heaven" was also debated, and in 1588 "Whether there exists a plurality of worlds?" was considered.[41] So academics and lay persons were influenced by Copernican ideas right from the beginning. Martin Luther is credited with remarking as early as 1533: "There is talk of a new astrologer who wants to prove that the earth moves and goes round instead of the sky...The fool wants to turn the whole art of astronomy upside-down."[42] All these examples serve to demonstrate that there was a growing awareness of some significant repercussions of Copernicus' cosmology for the inversion of the concept of the relation of earth and sun. It is very likely that in the midst of the considerations of these broader issues, there was also some reflection on the implications of these scientific discoveries for the relation of mother earth and father sun.

In closing this section on Copernicus, I would like to reflect on an analogical application of the thesis of a triple motion of the earth to some actual writings by women during this same period in history. In chapter 5 we will consider the works of women religious writers between 1200 and 1650. One of the striking aspects of these works is their affirmation of the value of three different actions of women which run counter to the Aristotelian model. Specifically, women will be calling for a "triple activity" of 1) self reflection, 2) self-governance, and 3) public action. It is interesting to ask, without seeking to go beyond the rather narrow limits of this natural analogy, whether there might be a

similarity in Copernicus delineation of the three motions of the earth. Of course, a crucial difference between women and natural entities such as the earth is the human exercise of free will in union with judgment. This means that self reflection, self governance, and public action is the consequence of *choice* in human beings, while the Copernican theory of the triple motion of the earth describes a necessary law rather than a free act. Therefore this natural analogy is not applicable beyond the simple fact that there is a turning in upon the self in self reflection, a rebalancing of the self in self governance, and a relation of self to other in public action. So to this limited extent it can be said that Copernicus' discovery of the triple motion of the earth, when applied analogically to the historical association of the earth with the cosmic female, a parallel "Copernican revolution" in the concept of woman in that the human female actually takes place during this same historical time frame.

Ennobling of "mother earth"

In Galileo Galilei's (1564-1642) *Dialogues concerning the two Chief World Systems*, a peripatetic philosopher named Simplicio debated the relative merits of Aristotelian and Ptolemian cosmology with Salviati, a defender of the new Copernican system. In the following passage the conflict between the two systems is clearly

stated:

> Simp. This way of philosophizing tends to subvert all natural philosophy, and to disorder and set in confusion heaven and earth and the whole universe. However, I believe the fundamental principles of the Peripatetics to be such that there is no danger of new sciences being erected upon their ruins.
>
> Salv. Do not worry yourself about heaven and earth, nor fear either their subversion or the ruin of philosophy. As to heaven, it is in vain that you fear for that which you yourself hold to be inalterable and invariant. As for the earth, we seek rather to ennoble and perfect it when we strive to make it like the celestial bodies, and, as it were, place it in heaven, from which your philosophers have banished it.[43]

Although this text was written in 1629 and published in 1632, the goal of "ennobling" the earth was Galileo's plan from the beginning of his theoretical work. Between 1584 and 1590 Galileo wrote some reflections on Aristotle's *On the Heavens* and *On Generation and Corruption* which were later published in a text entitled *Galileo's Early Notebooks: the Physical Questions*. He began his second questions with a reflection on the controversy between Ptolemy's view that the earth is at the centre of the universe and the Pythagorean and Copernican view that the sun is at the centre of the universe. Galileo then presented arguments in support of both sides. In support of the Aristotelian view he argued first that because the earth is the heaviest body, it tends to the lowest place, which means that it would also be furthest from the heavens, and therefore at the centre of the universe. He then reflected on the association of this theory with the lack of "nobility" of the earth:

> Confirmation: since earth is the least noble body of all, by right it should be located in the center, lest the remaining bodies suffer harm by reason of their

> closeness to it, and because in this way its imperfections can be supplemented better and more suitably through the influence of other bodies.[44]

This repetition of the Aristotelian claim that the earth was less noble than the sun was an obvious inheritance of the polarity of value which was so prevelant in the Greek thinker's cosmology. If the earth is associated with cosmic mothering, and the sun with cosmic fathering then a devaluation or a re-evaluation such as the 'ennobling' of the earth has implications for the concept of woman.

Galileo invoked a wide range of arguments throughout his life to support the ennobling of the earth. In addition to the claim that there is motion of the earth on its axis, and that it moves around the sun, Galileo also considered the question of the nature of the earth itself. He has Salviati ask Simplicio: "But what is it you understand by "earth?" The Aristotelian argues that it "is the primary substance of our globe" and he implies that it is the fertile material that supports plants. Galileo's foil rejects this view of a common nature of the earth and argues that this is actually only the surface. Appealing to a theory of William Gilbert that the earth was for the most part a large magnetic kind of loadstone Salviati argues that the interior of the earth must be dense and solid like a hard rock.[45] So the ignoble organic mother earth of Aristotle has for Galileo become a noble magnetic stone.

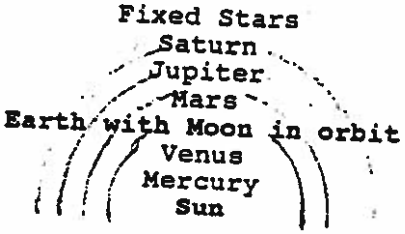
In Galileo's argument we begin to suspect a different sort of result than was originally anticipated through his proclaimed "ennobling" of the earth. On the one hand, it could be argued that the concept of earth as a magnetic stone was considered as more

noble than a material which provided the fertile ground for organic life, because a stone is less corruptible. In addition, the claim that the earth was a magnetic centre also ascribed a kind of hidden power to the earth. Mother earth has become sterile. In other words, a rock has no organic life within it. So we find Galileo giving a completely different interpretation of earth than would have been included in an Aristotelian concept of nature as having a source of movement within itself or of the female mother earth as "generating in itself." While a rock or magnetic stone is less corruptible than fertile earth, it is sterile.

R. G. Collingwood in *The Idea of Nature* sees the dangers in this description of earth, and he accuses Galileo of arguing that the truth of nature consists in mathematical facts alone. He concludes: "Thus Galileo's world is a world of pure quantity, which through the inexplicable intrusion into it of living and sensible beings acquires the diversified qualitative aspect with which we are familiar."[46] He views Galileo as taking an important step on the way of no longer conceiving of nature and the earth as a living organism but instead as "inert matter." Therefore with this step of Galileo, mother earth may have been ennobled only to be sacrificed soon after.[47]

In addition, when we compare these views about the earth with statements that Galileo made about the sun, it will be seen that a new polarity of value emerged in which there was a displacement in favour of the sun. Once again if we return to Galileo's early notebooks, we will find him providing a proof for the theory that

As can be seen from this chart, in Copernicus' system the positions of the sun and earth with moon were simply interchanged from the ones they held in original Aristotelian system. This constitutes what I call the "Copernican inversion" of earth and sun.[35] Mother earth has shifted from the static bottom to the active middle of the universe, while father sun shifted from active circular motion to a static centre point in the universe.



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